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PACIFIC GAS AND ELECTRIC COMPANY
COST OF CAPITAL 2020
SUPPLEMENTAL TESTIMONY



PACIFIC GAS AND ELECTRIC COMPANY
COST OF CAPITAL 2020
SUPPLEMENTAL TESTIMONY

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PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 1

COST OF CAPITAL PROPOSAL

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 1
COST OF CAPITAL PROPOSAL

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 1
COST OF CAPITAL PROPOSAL

A. Introduction and Summary

In this supplement to its direct testimony filed April 22, 2019 (Direct Testimony), Pacific Gas and Electric Company (PG&E) requests to modify its Rates of Return on its investments in California Public Utilities Commission (CPUC or Commission) jurisdictional assets for the Test Year 2020 as proposed in its Direct Testimony. In that testimony PG&E proposed a Return on Equity (ROE) of 16 percent that reflected the high cost to PG&E investors of bearing almost unlimited risk of liabilities due to wildfires. Since that testimony was filed, California Assembly Bill (AB) 1054 has been passed by the legislature and signed into law by Governor Newsom. It was effective immediately as an urgency statute. Among other things, AB 1054 establishes a Wildfire Fund and enacts new rules that are expected to reduce the financial impact of future wildfires on PG&E and other participating utilities. As a result, PG&E is revising downward its ROE request to 12 percent.¹ The revision to its ROE and overall rate of return on rate base is shown below on Table 1-1.

TABLE 1-1
PROPOSED COST OF CAPITAL (REVISED)

| Line No. | | Cost | Capital Structure | Weighted Cost |
|----------|---------------------|--------|-------------------|---------------|
| 1 | Long-term debt | 5.16% | 47.5% | 2.45% |
| 2 | Preferred stock | 5.52% | 0.5% | 0.03% |
| 3 | Common equity | 12.00% | 52.0% | 6.24% |
| 4 | Return on Rate Base | | | 8.72% |

¹ The passage of AB 1054 does not directly impact PG&E's test year 2020 cost of debt. However, that estimated cost of debt would be impacted by PG&E's exit financing should it successfully consummate and implement a Chapter 11 Plan of Reorganization. As stated in PG&E's direct testimony, PG&E expects to file a new cost of capital application on or about the time it emerges from bankruptcy.

1 **B. Background of PG&E's Original ROE Request of 16 Percent**

2 PG&E's original ROE request of 16 percent was based on analysis of typical
3 United States (U.S.) utilities, as well as analysis of the higher risks faced by
4 California utilities, including the almost unlimited risk of wildfire liabilities. PG&E
5 witness Dr. Michael Vilbert estimated the ROE of a typical utility without any
6 wildfire risk to be in the range of 10 percent to 11 percent,² and placed PG&E's
7 ROE at the high end of that range, 11 percent. Dr. Vilbert also observed that
8 PG&E's investors are exposed to greater risks than the average U.S. utility, and
9 concluded that an appropriate ROE reflecting PG&E's current level of risk could
10 be in the range of 13 percent to 18.5 percent.³ Dr. Vilbert recommended a base
11 ROE of 11 percent, while stating that the ROE could be as high as 14 percent to
12 16 percent.⁴

13 PG&E witness Frank Graves made an explicit estimate of PG&E's exposure
14 to wildfire risk, and concluded that the annual cost for shareholders to bear
15 wildfire risk under the laws prevailing at the time he prepared his testimony was
16 about \$1 billion, which is equivalent to a return of 500 basis points on the equity
17 portion of PG&E's rate base. Combining Mr. Graves' analysis with Dr. Vilbert's
18 11 percent ROE resulted in a 16 percent ROE approximately in the middle of
19 Dr Vilbert's range of 13.0 percent to 18.5 percent, and consistent with
20 Dr. Vilbert's conclusion that an appropriate ROE could be as high as 14 percent
21 to 16 percent.

22 PG&E's proposed 16 percent ROE reflected the assumption that liabilities
23 from all wildfires for which PG&E's equipment was the source of ignition could
24 be passed on to PG&E shareholders regardless of fault, based on laws and
25 regulations as of April 2019. In its direct testimony, PG&E acknowledged efforts
26 of Governor Newsom and state legislators to establish a framework which would
27 not place so much risk on utility shareholders. In early July 2019 the legislature
28 passed, and the governor signed, legislation⁵ to mitigate the risk of wildfire
29 liabilities to utility shareholders. The legislation establishes several mechanisms

2 PG&E Prepared Testimony, Chapter 2, page 2-1, line 32.

3 *Id.* P. 2-86, Table 2-23.

4 *Id.* Page 2-88 line 18.

5 AB 1054 was passed by the legislature on July 10 and signed by Governor Newsome on July 12.

1 that are expected to reduce the current level of wildfire-related financial risk to
2 shareholders.

3 **C. The State Has Taken a Major Step to Reduce the Risk That the Financial**
4 **Impact of Wildfire Liabilities Will Be Borne Exclusively by Utility**
5 **Shareholders**

6 AB 1054, approved by the California Legislature in early July 2019 and
7 signed by Governor Newsom on July 12, is expected to impact the risk of utility
8 exposure to wildfire liabilities through provisions that:

- 9 1) create a statewide wildfire fund that will be available for eligible utilities to
10 pay eligible claims for liabilities arising from future wildfires that are caused
11 by the applicable utility's equipment (subject to the terms of AB 1054), which
12 would provide liquidity to such utilities for timely payment of wildfire liabilities
13 to victims;
- 14 2) provide that utilities that draw from the wildfire fund will only be required to
15 repay amounts that are determined by the CPUC not to be just and
16 reasonable;
- 17 3) limit, while the wildfire fund is operative, utilities' responsibility for wildfire
18 claims that are determined by the CPUC not to be just and reasonable to
19 20 percent of a utility's equity portion of its electric transmission and
20 distribution rate base (approximately \$2.7 billion for PG&E based on
21 estimated 2020-2022 rate base) on a rolling 3-year basis; and
- 22 4) change the prudent manager standard to be utilized by the CPUC in
23 determining if a utility should be responsible for some portion of damages of
24 a wildfire attributed to an ignition source of the utility.

25 If PG&E satisfies the eligibility requirements of AB 1054 to participate in the
26 wildfire fund, the first three provisions are expected to have an impact on the
27 financial risk of future wildfires to PG&E. The combination of the wildfire fund
28 and disallowance cap is expected to provide investors with a higher degree of
29 certainty, relative to the state of the law in April 2019, that a utility that causes a
30 major wildfire will have the financial resources to pay claims as they are settled,
31 prior to any finding by the Commission of whether the utility should bear a
32 portion of the claims, assuming that the utility satisfies the eligibility requirements
33 for participation in the wildfire fund, the utility has adequate insurance coverage
34 for non-eligible claims, the wildfire fund functions as expected, the utility

1 otherwise has adequate liquidity and the wildfire fund is not depleted prior to
2 payment of such claims.

3 The fourth mechanism, the change in the Commission's prudent manager
4 standard, brings the Commission's approach more in line with the Federal
5 Energy Regulatory Commission's standard for prudence. The revised standard
6 may provide investors with greater certainty that PG&E's conduct will be
7 determined by the Commission to be just and reasonable in connection with
8 future wildfires, thereby improving the credit quality and risk perception of PG&E
9 in connection with wildfires. However, implementation of the statutory standards
10 in actual Commission proceedings is yet to be tested, which contributes to
11 uncertainty among investors.

12 Upon the termination of the fund the first three provisions above cease to
13 have any impact on risk. As a result, upon the termination of the fund
14 shareholders will again bear the same financial risk in connection with future
15 wildfires as today, all else remaining equal. The fourth provision continues
16 beyond the duration of the wildfire fund, but is untested, and it may be difficult in
17 the near-term for investors to evaluate how the revised standard will be
18 implemented in future applications for wildfire cost recovery.

19 Further, another important factor is the degree to which continuing
20 investments and efforts to harden PG&E's system and reduce the frequency of
21 ignitions as well as to reduce the adverse consequences of wildfires is also
22 difficult for investors to quantify.

23 PG&E concludes that for the foreseeable future, and for the duration of the
24 wildfire fund, its financial risk in connection with future wildfires is likely to be
25 substantially reduced relative to when it filed its cost of capital application in
26 April 2019, assuming that PG&E satisfies the eligibility requirements for
27 participation in the wildfire fund, PG&E has adequate insurance coverage for
28 non-eligible claims and the wildfire fund functions as expected.

29 **D. PG&E Proposes to Revise Its ROE Request From 16 Percent to 12 Percent**

30 As a result of the AB-1054 provisions discussed above, as well as
31 consideration of Dr. Vilbert's original testimony, and the supplemental testimony
32 of Dr. Vilbert and Mr. Graves, PG&E revises its ROE request to 12.0 percent.
33 PG&E's revised ROE reflects the expected decrease in risk of wildfire liabilities
34 that PG&E may face. As long as the fund is active and adequately funded and

PG&E maintains reasonable insurance coverage, PG&E's exposure to claims for third-party damages resulting from future wildfires is expected to be initially capped at about \$2.7 billion on a rolling three-year basis (subject to adjustment as provided in AB 1054).⁶

1. A Fair and Reasonable ROE for PG&E Is in the Range of 11 Percent to 16 Percent

Dr. Vilbert (see Chapter 2) has confirmed the analysis in his direct testimony is still applicable, and that a reasonable ROE for PG&E, without consideration of wildfire risk, is at least 11 percent, and as high as 14 percent to 16 percent.

Mr. Graves (see Chapter 3) provides an update (Supplemental Report on Wildfire Risk), to the April 22 report⁷ on wildfire risk to account for the impacts of AB 1054 on PG&E's financial risk in connection with future wildfires. Using the same methods as in his direct testimony, Mr. Graves concludes that, depending on assumptions of wildfire magnitude and frequency, the cap on utility wildfire liability leaves shareholders still bearing some risk, and estimates that the cost of bearing that risk is in the range of \$0 to \$300 million per year,⁸ which in terms of an ROE equivalent would range from 0 percent to 2 percent. That analysis would place PG&E's ROE in the range of 11 percent to 13 percent.

2. A reasonable ROE for PG&E Is 12 Percent

PG&E expects that it will meet the legal and regulatory requirements to participate in the wildfire fund, including bankruptcy court approval, and that for the foreseeable future, and for the duration of the wildfire fund, its financial risk in connection with future wildfires is likely to be substantially reduced relative to when it filed its cost of capital application in April 2019, assuming that PG&E satisfies the eligibility requirements for participation in

⁶ For wildfires occurring between the effective date of AB 1054 and PG&E's emergence from Chapter 11, PG&E's ability to draw from the wildfire fund will be limited to up to 40% of claims for third-party damages resulting from such wildfires.

⁷ See the direct testimony of Mr. Frank Graves, "California Megafires: Approaches for Risk Compensation and Financial Resiliency Against Extreme Events."

⁸ Mr. Graves considers the scenario in which shareholders are assigned no cost responsibility, resulting in no additional cost to bear the risk of wildfire liabilities.

1 the wildfire fund, PG&E has adequate insurance coverage for non-eligible
2 claims and the wildfire fund functions as expected.

3 From the analysis of Dr. Vilbert and Mr. Graves, PG&E concludes that
4 an ROE in the range of 11 percent to 16 percent is reasonable. PG&E
5 recognizes that the assumptions in the analysis about the cost of bearing
6 wildfire risk and the magnitude and severity of wildfires could be lower or
7 higher than assumed. Nonetheless, weighing the expected risk reductions
8 from the implementation of AB 1054 against the risks that drove PG&E's
9 earlier ROE proposal of 16 percent, PG&E believes that a 12 percent ROE
10 reflects the appropriate level of risk currently.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 2

RETURN ON EQUITY

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CHAPTER 2
RETURN ON EQUITY

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 2
RETURN ON EQUITY

A. Introduction

My name is Michael J. Vilbert. My business address is The Brattle Group (Brattle), 201 Mission Street, Suite 2800, San Francisco, California. I submitted Direct Testimony in this proceeding. Appendix A attached to my direct testimony provides more detail on my qualifications.

In this Supplemental Testimony, I consider the effect of the passage of Assembly Bill (AB) 1054 on my cost of capital estimates for Pacific Gas and Electric Company (PG&E or the Company).

B. Effect of AB 1054 on PG&E's Return on Equity

As I noted in my Direct Testimony, my cost of capital estimate did not include a premium for the Company's exposure to the asymmetric risk stemming from the policy of inverse condemnation as applied in California with regard to the liability from wildfire damages.¹

The Supplemental Testimony of my Brattle partner, Mr. Frank C. Graves, addresses the effect of AB 1054 on the asymmetric risk faced by PG&E due to wildfire liability. In general, AB 1054 is designed to address wildfire risk in California and requires PG&E to exit bankruptcy not later than June 30, 2020 if the Company wishes to participate in the Wildfire Insurance Fund. The law also requires the investor-owned utilities (IOU) in California to contribute money to the fund and to make safety investments for which the IOUs will earn no equity return on investment in exchange for a cap on liabilities as a result of wildfire damages.

None of the analyses I performed to estimate the cost of capital for the Company in my Direct Testimony was directly affected by wildfire risk. As I noted in my Direct Testimony, wildfire risk is diversifiable and does not affect systematic risk.² Nor does the requirement that PG&E exit bankruptcy by June 30, 2020 affect the analyses because I explicitly did not try to estimate the

¹ Vilbert Direct Testimony, p. 2-6 and footnote 17, p. 2-15.

² Vilbert Direct Testimony, Section B.2.b.

1 cost of capital for a bankrupt company.³ None of the cost of capital analyses
2 I performed in my Direct Testimony are directly affected by the passage of
3 AB 1054.

4 My recommended ROE for PG&E was for “a regulated utility without the
5 potential liability from wildfire.”⁴ However, I noted that this is not PG&E’s current
6 situation. Therefore, I estimated PG&E’s cost of capital based on its higher level
7 of risk, but did not incorporate wildfire risk.⁵

8 The passage of AB 1054 is clearly a step in the in the right direction to
9 mitigate wildfire risk. The passage of AB 1054 has reduced PG&E’s total risk,
10 but it has not reduced the Company’s systematic risk, which is the risk that
11 affects the cost of capital. The analysis I conducted for my original testimony
12 used regulated electric utilities (Electric Utility Sample), regulated water and gas
13 local distribution utilities, non-electric utilities (Regulated Utility Sample), and
14 non-regulated group (of capital intensive network industries [non-regulated CINI
15 Sample), which did not reflect wildfire risk.⁶

16 Although AB 1054 reduces part of PG&E’s total risk, i.e., part of the
17 Company’s asymmetric risk, it does not eliminate it.

18 As I explained in my Direct Testimony:

19 I believe that the cost of capital for PG&E currently is likely to be much
20 higher due to the combination of uncertainty associated with wildfire risk and
21 the amount of cost recovery, if any, that will be authorized, bankruptcy, and
22 a plummeting stock price. Although I recommend that the Company be
23 allowed an ROE of 11 percent for a capital structure with 52 percent equity,
24 the actual market risk of the Company could be much higher. PG&E is of far
25 greater risk than the average company in the sample given PG&E’s unique
26 circumstances. The additional return for these risk factors would justify an

3 Vilbert Direct Testimony, p. 2-8, p. 2-11.

4 Vilbert Direct Testimony, p. 2-9, lines 11-12.

5 *Id.*, lines 12-17.

6 I did perform an analysis using companies with a 5 safety ranking by *Value Line* since PG&E’s *Value Line* Safety Rating was 5. PG&E is now ranked 4 by *Value Line*, one step better than the 5 Safety Rating. However, removing the results of my *Value Line* 5 analysis does not change my recommendation for PG&E. Table 2-15-Revised and Table 2-23-Revised from my direct testimony (Vilbert Direct Testimony, pp. 2-65 and 2-88, respectively) without the *Value Line* 5 sample are included below for the reader’s convenience.

1 allowed ROE greater than a point estimate for an average risk
2 electric utility.⁷

3 I attempted to quantify the increase in the cost of capital for the additional
4 risk PG&E faces in Section G of my Direct Testimony. As I show in
5 Table 2-15-Revised and Table 2-23-Revised, PG&E's cost of capital could be in
6 the range of 13 to 18.5 percent.⁸ My opinion is unchanged that PG&E's cost of
7 capital could be much higher than the 11 percent ROE I recommended for
8 PG&E as a regulated electric utility without exposure to wildfire liability.
9 Weighing all of the evidence, I concluded that "PG&E's cost of capital under the
10 current circumstances could be as high as 14-16 percent."⁹

7 Vilbert Direct Testimony, p. 2-15.

8 Vilbert Direct Testimony, p. 2-86.

9 Vilbert Direct Testimony, p. 2-88.

TABLE 2-15-REVISED
RISK POSITIONING COST OF EQUITY ESTIMATES

| Line No. | Sample / Model | Scenario 1 (a) | Scenario 2 (b) |
|--|----------------------------|----------------|----------------|
| <u>Electric Utility Sample</u> | | | |
| 1 | CAPM | 8.7% - 9.0% | 9.1% - 9.4% |
| 2 | ECAPM ($\alpha = 0.5\%$) | 8.9% - 9.3% | 9.3% - 9.7% |
| 3 | ECAPM ($\alpha = 1.5\%$) | 9.3% - 9.8% | 9.7% - 10.1% |
| <u>Water and Gas Sample</u> | | | |
| 4 | CAPM | 9.7% - 10.3% | 10.2% - 10.8% |
| 5 | ECAPM ($\alpha = 0.5\%$) | 9.8% - 10.5% | 10.3% - 11.0% |
| 6 | ECAPM ($\alpha = 1.5\%$) | 10.1% - 10.9% | 10.6% - 11.4% |
| <u>Regulated Utility Sample</u> | | | |
| 7 | CAPM | 10.6% - 11.3% | 11.2% - 12.0% |
| 8 | ECAPM ($\alpha = 0.5\%$) | 10.6% - 11.5% | 11.3% - 12.1% |
| 9 | ECAPM ($\alpha = 1.5\%$) | 10.8% - 11.8% | 11.4% - 12.5% |
| <u>CINI Sample</u> | | | |
| 10 | CAPM | 10.7% - 11.4% | 11.3% - 12.1% |
| 11 | ECAPM ($\alpha = 0.5\%$) | 10.7% - 11.5% | 11.4% - 12.2% |
| 12 | ECAPM ($\alpha = 1.5\%$) | 10.9% - 11.8% | 11.5% - 12.5% |
| <u>CINI, Non-Regulated Sample</u> | | | |
| 13 | CAPM | 14.8% - 16.3% | 16.1% - 17.6% |
| 14 | ECAPM ($\alpha = 0.5\%$) | 14.6% - 16.2% | 15.8% - 17.5% |
| 15 | ECAPM ($\alpha = 1.5\%$) | 14.1% - 16.1% | 15.3% - 17.3% |

Sources and Notes:

Ranges encompass estimates from Financial Risk Adjusted method and Hamada Adjustment with and without taxes.

(a) Long-term Risk-free Rate of 4.40%, Long-term Market Risk Premium of 7.07%.

(b) Long-term Risk-free Rate of 4.15%, Long-term Market Risk Premium of 8.07%.

TABLE 2-23-REVISED
SUMMARY OF ESTIMATES TO ACCOUNT FOR ADDITIONAL RISK

| Line No. | Model | ROE |
|--|---|---------------|
| <u>Risk Positioning Model Estimate Ranges</u> | | |
| 1 | CINI, Non-Regulated Sample | 14.1% - 17.6% |
| <u>Bond Risk Premium Analysis</u> | | |
| 2 | 3% - 8% Premium estimate (relative to 7% bond yield) | 10% - 15% |
| <u>Debt Equivency Premium Analysis</u> | | |
| 3 | 2.5% - 5.5% Premium estimate (relative to 10.5% base ROE) | 13% - 16% |

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 3

ASYMMETRIC WILDFIRE RISKS

PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 3
ASYMMETRIC WILDFIRE RISKS

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1 **PACIFIC GAS AND ELECTRIC COMPANY**
2 **CHAPTER 3**
3 **ASYMMETRIC WILDFIRE RISKS**

4 **A. Background**

5 Our names are Frank C. Graves and Robert S. Mudge. We are Principals at
6 The Brattle Group ("Brattle"), an international consulting firm providing planning,
7 policy analysis, and valuation support in energy and regulatory economics,
8 commercial litigation support, competition analysis. Our corporate headquarters
9 are at One Beacon Street, Suite 2600, Boston, Massachusetts.

10 Prior to this testimony, in April 2019 Frank Graves testified on behalf of
11 PG&E on wildfire risk and cost recovery, referring to a more extensive white
12 paper Brattle had written (with Mr. Mudge a co-author) describing the
13 asymmetric nature and estimated cost of wildfire damage cost exposure. This
14 report has now been updated to reflect the new terms and conditions for fire
15 damages funding under AB 1054. That supplemental report is attached as
16 Attachment 1.

17 **B. Qualifications and Experience**

18 Frank Graves has been a consultant to the electric and gas industries for
19 over 35 years, having provided planning advice and testified in many
20 jurisdictions on a wide variety of matters related to resource planning, service
21 pricing, financial risk, prudence, and cost recovery. His academic training was
22 focused on finance and mathematical modeling at Massachusetts Institute of
23 Technology, where he received a Master of Science degree in Management
24 in 1980.

25 Robert Mudge is a former investment and commercial banker, consulting to
26 various energy clients on issues relating to valuation, liquidity, corporate
27 restructuring, contract terminations or amendments, special capital needs,
28 acquisitions and divestitures, and the cost of capital. He also has practical
29 experience as a Chief Financial Officer having served in that role for Brattle for
30 several years. He received an M.B.A. in Finance and Economics from the
31 University of Chicago, Graduate School of Business and a B.A. from Harvard
32 College. A full description of his background and qualifications in a resume

1 containing the details of career experience and publications is included as
2 Appendix A.

3 **C. Purpose of the Supplemental Report**

4 The purpose of this testimony and our supplemental report is to present an
5 addendum to our white paper originally prepared by us and our colleagues at
6 Brattle for PG&E in October 2018 (the “October 2018 Report”) discussing the
7 extreme risks and potential uncompensated cost recovery liabilities faced by
8 PG&E from recent wildfires in California. The basic framework for risk
9 measurement and costing presented in that original report is used here again,
10 but we have updated it to reflect key provisions of Assembly Bill (“AB”) 1054 that
11 have implications for the extent of wildfire risk affecting utilities in California
12 generally and PG&E specifically. Our analysis models the residual risk that
13 remains after the establishment of the Fund, as a result of “coverage gaps”
14 arising from the size and rules for use of the Fund. Based on these coverage
15 gaps as well as other utility costs to be incurred as a result of AB 1054, we find
16 PG&E’s remaining exposure to wildfire liabilities has a cost of \$8 to \$360 million
17 per year.

18 **D. Major Changes in AB 1054 Requiring Updates to the Original Calculations**

19 The centerpiece of the legislation is the creation of a wildfire fund and
20 outlines criteria for its availability to utilities, according to their conduct related to
21 the wildfire ignition. The October 2018 Report submitted with April testimony did
22 not consider any such mechanism.

23 For eligible claims, AB 1054 also establishes a liability cap and new legal
24 standards for cost recovery based on a presumption of reasonable utility
25 conduct in connection with wildfires. In combination, these new provisions
26 reduce utility risk from wildfires and call for an adjustment to the range of ROE
27 premia calculated in the October Report.

28 We focus principally on (1) the likely adequacy of the Fund relative to
29 publicly available indicia of wildfire risk statewide, based on its size and key
30 provisions; and (2) the aforementioned coverage gaps as they affect PG&E at
31 the individual utility level in the near term. Our major conclusions are
32 summarized in Attachment 1.

E. Implications Specific to PG&E

There are certain terms in AB 1054 related to what we will refer to as “deductibles” in the form of reimbursement obligations to the Fund that are specific to the size of the Transmission and Distribution rate base of the utility in question. These cap exposure in the event that the utility’s fire management conduct is found to not justify assigning full cost responsibility to ratepayers. For PG&E, we find these could create statistically expected annual exposure ranging from approximately \$50 million to \$140 million per year, corresponding to incremental ROE levels of 25 to 72 basis points. The utility also faces statistically expected exposure to potential Fund shortfall, which though unlikely could arise as soon as the first year of the Fund’s life and which becomes more likely in distant future years as the Fund is used. For PG&E shareholders, the cost of bearing this exposure to these shortfalls against its own range of wildfire costs ranges from approximately \$8 million to \$360 million per year, corresponding to an incremental ROE range of 4 to 180 basis points.

These amounts do not include any request for compensation if PG&E were to be denied access to the Fund, nor any compensation for past contributions, lost equity returns on capitalized mitigation cost expenditures, or any exposure to future Fund replenishment (or growing depletion risk) in years beyond 2022. It is very likely that equity investors will regard those as risky and perhaps unreasonable loss exposures that will affect their willingness to invest. Additionally, the wide range of potential risk creates uncertainty for shareholders and potential investors. By excluding these considerations, these estimates are conservative.

Many further details of how risks were analyzed across the state and were reflected over three year periods within which the “deductible” caps apply are presented in our supplemental report.

Supplemental Report on Wildfire Risk and AB 1054

PREPARED FOR



PREPARED BY

Frank C. Graves

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August 1, 2019

THE **Brattle** GROUP

Notice

This report was prepared for Pacific Gas and Electric Company (“PG&E”). PG&E has not prepared or independently confirmed the analysis in this report. All results and any errors are the responsibility of the authors and do not represent the opinion of The Brattle Group generally or its client.

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I. Executive Summary

Assembly Bill (“AB”) 1054 was signed into law by Governor Newsom on July 12, 2019. The new law seeks to address utility wildfire risk by, among other things, establishing an insurance-like Wildfire Fund (the “Fund”). Accordingly, this supplemental report elaborates on a previous October 2018 report (the “October Report”) that discusses the extreme wildfire risks and potential uncompensated cost recovery liabilities faced by Pacific Gas & Electric (“PG&E”) and other investor-owned California utilities.

We acknowledge the incremental utility protections offered by AB 1054. In addition, however, using an analytic framework similar to that in the October Report, we also observe the possibility that the Fund could become inadequate to cover statistically expected wildfire risk over the next ten years. We also highlight the ROE premia needed in the immediate near term to compensate for “coverage gaps” within AB 1054, such as the risk associated with potential utility “deductibles” in the form of reimbursements obligations to the Fund and potential reductions in Fund balances below levels sufficient to protect against wildfire risks estimated for PG&E in the October Report.

II. Purpose

Assembly Bill (“AB”) 1054 has introduced new risk-sharing and insurance-like mechanisms to help assure liquidity and longer term protection for utilities in the face of damage liabilities for wildfires in which utility assets played a causal role. The legislation authorizes the creation of a wildfire fund and criteria for its dispersal to utilities, according to their success in satisfying mitigation standards. The first Brattle report in regard to wildfire impacts on utility cost recovery, prepared in October 2018,¹ did not consider any such mechanism. This addendum to our original report estimates how much the new law could reduce (but not eliminate) risk and how its protections alter the required supplemental return on equity (“ROE”) allowances needed by California utilities. Specifically, our analysis undertakes to identify incremental costs and coverage gaps associated with AB 1054 with calculations centered on Pacific Gas and Electric’s (“PG&E”) wildfire risk characteristics established in our first report.

III. Summary of Our Original Report

In our original report for PG&E in October 2018 (the “October 2018 Report”), we calculated the annual dollar amount for expected losses from potential wildfire damages that could exceed the utility’s commercial insurance, using data underlying a 2018 catastrophe bond issuance on PG&E’s behalf in 2018. That loss was expressed as a percentage of the maximum loss (maximum coverage needed) and that loss ratio was applied to empirical evidence on recent pricing of commercial disaster insurance to determine the effective cost of the utility bearing such exposure (as if they were an insurance company). There, those losses were not limited by a Wildfire Fund such as AB 1054 has now created, resulting in very large costs from uninsured asymmetric risk equal to several hundred basis points against equity rate base.

If PG&E were to replicate insurance-like coverage for up to \$22.8 billion—the catastrophe bond data showed that it would need approximately \$1.0 billion of incremental net income to compensate for the risk. This could correspond to an ROE increment of approximately 500 basis points.

¹ Frank Graves et al., “California Megafires: Approaches for Risk Compensation and Financial Resiliency Against Extreme Events,” October 1, 2018.

Figure 1
Expected Cost of Insuring Total Exposure with Catastrophe Bonds

| | | | |
|--|---------------|------|--------|
| Risk Study Max Exposure | (\$ Billions) | [1] | 15.7 |
| 3rd Party Insurance | (\$ Billions) | [2] | 1.2 |
| Net Exposure | (\$ Billions) | [3] | 14.5 |
| Gross Up for Total Utility Liabilities | | [4] | 1.58 |
| Total Exposure | (\$ Billions) | [5] | 22.8 |
| Expected Loss | (%) | [6] | 0.14% |
| CAT Bond Regression | | | |
| <i>Slope</i> | | [7] | 1.3637 |
| <i>Intercept</i> | | [8] | 0.0173 |
| <i>Multiplier</i> | | [9] | 2.4 |
| Premium | (%) | [10] | 4.65% |
| Annualized Cost | (\$ Billions) | [11] | 1.06 |
| ROE Allowance | | | |
| <i>Rate Base</i> | (\$ Billions) | [12] | 36.2 |
| <i>Equity Ratio</i> | (%) | [13] | 52% |
| <i>Allowance for \$1.06 Billion</i> | (%) | [14] | 5.0% |
| <i>Allowance for \$1.4 Billion</i> | (%) | [15] | 7.0% |

Sources and Notes:

[1]: AIR model. See Graves *et al.*, "California Megafires: Approaches for Risk Compensation and Financial Resiliency Against Extreme Events," October 1, 2018, page 28.

[2]: Property damage coverage as estimated by PG&E. See Graves *et al.*, "California Megafires: Approaches for Risk Compensation and Financial Resiliency Against Extreme Events," October 1, 2018, page 28.

[3]: [1] - [2].

[4]: Based on PG&E estimates of costs other than third-party property damages. See Graves *et al.*, "California Megafires: Approaches for Risk Compensation and Financial Resiliency Against Extreme Events," October 1, 2018, page 30.

[5]: [3] x [4].

[6]: AIR model. See Graves *et al.*, "California Megafires: Approaches for Risk Compensation and Financial Resiliency Against Extreme Events," October 1, 2018, page 28.

[7] - [9]: Linear relationship based on CAT Bonds from January 2018 to August 2018, excluding the PG&E wildfire CAT Bond.

[10]: ([6] x [7] + [8]) x [9].

[11]: [5] x [10].

[12] - [13]: In addition to the CPUC General Rate Case ("GRC") rate base (\$25.6 billion updated for tax reform), PG&E has a Gas Transmission and Storage ("GT&S") rate base of \$3.7 billion and a Transmission Owner ("TO") rate base of about \$6.9 billion, both under FERC jurisdiction. See Pacific Gas and Electric Company, Form 10-K for the Fiscal Year Ended December 31, 2017, pages 12, 69, 71, and 72, accessed April 2018, <http://investor.pgecorp.com/financials/sec-filings/default.aspx>.

[14]: [11] / ([12] x [13]).

[15]: 1.4 / ([12] x [13]).

IV. Key Features of AB 1054

At its core, AB 1054 establishes, a) a Wildfire Fund (“the Fund”), described below, to provide liquidity and insurance to California utilities in the event of wildfires, b) new standards for findings of reasonable conduct, and c) mitigation and Fund eligibility requirements.

A. The Wildfire Fund

AB 1054 authorizes two possible wildfire-funding structures. One option for fund configuration requires no initial contributions by utilities and would address liquidity needs only. It provides no insurance type benefits, in the sense of capping or sharing of risk, just liquidity. Here, the focus is entirely on the insurance type fund, which we understand is the option selected by SCE and SDG&E (and PG&E has elected to join).

The insurance-like fund requires initial contributions as follows:

- \$10.5 billion funded primarily by a Department of Water Resources bond offering, supported by a non-bypassable charge on ratepayers (initial funding may be provided by the state), plus
- Another \$10.5 billion funded by investor-owned utilities, initially \$7.5 billion in proportions of the Wildfire Fund allocation which are defined as 64.2% for PG&E, 31.5% for SCE, and 4.3% for San Diego Gas & Electric (“SDG&E”)², plus \$300mm/year for 10 years similarly apportioned.³

Thus, large investor-owned utility contributions will total \$18.3 billion in 2020, potentially reaching \$21 billion by 2029. Importantly, notwithstanding the percentage contributions noted above, the Fund creates a pool for the participating investor-owned utilities, not specific shares for the large investor-owned utilities.

The law establishes many requirements, including having a valid fire safety certificate based on an approved mitigation plan, an agreement to implement the suggestions of its safety culture assessment, an established safety committee and a board-of-director level committee that reports to the commission on safety matters. Assuming all such threshold eligibility preconditions have been met, the law additionally establishes a stepped process for determining the utility's obligation to reimburse the fund:

- The CPUC reviews the utility's conduct to determine if cost recovery is just and reasonable. If the utility has a valid safety certification, its conduct is deemed reasonable unless another party raises a serious doubt, in which case the utility has the burden of proving

² AB 1054 Section 16.

³ Subject to clarification in the statute. Small IOUs may make additional small contributions (with limited access to fund).

reasonableness. The CPUC may allocate the costs in whole or part, taking into account factors both within and beyond the utility's control.

- The utility is required to reimburse the fund for the amount allocated by the CPUC to the utility, except that the CPUC's disallowance is subject to a cap equal to 20% of its T&D equity rate base. The cap is calculated for three calendar years.
- However, the cap does not apply (1) if the wildfire results from the utility's actions or inactions that constituted conscious or willful disregard of the rights or safety of others, or (2) if the utility fails to maintain a valid safety certification.

B. New Reasonableness Standards

AB 1054 creates a new standard that the CPUC must apply to determine whether a utility was prudent and therefore able to recover wildfire costs through the Fund or, if the Fund has been exhausted, through electric rates. Under AB 1054, prudent conduct occurs when the conduct of a utility related to the ignition was consistent with actions that a reasonable utility would have undertaken under similar circumstances, at the relevant point in time, and based on the information available at that time. Utilities with a valid safety certification will be presumed to have acted prudently related to a wildfire ignition unless a party in the cost recovery proceeding creates serious doubt as to the reasonableness of the utility's conduct, at which time, the burden shifts back to the utility to prove its conduct was reasonable. If a utility does not have a valid safety certification, it will have the burden to prove, based on a preponderance of evidence, that its conduct was prudent. We understand that the new standards mandated by AB 1054 condition utilities' ability to recover wildfire costs in rates generally, as well as their access to the Fund as discussed in more detail below.

C. Mitigation and Eligibility Requirements

Under AB 1054, a utility is not allowed to include its share of the first \$5 billion of capex for wildfire mitigation from its equity rate base. Each utility's share is equal to the Wildfire Fund allocation percentages described above. Therefore, PG&E cannot include its portion of wildfire mitigation capital costs in its equity rate base.

V. Utility Costs and Coverage Gaps

The costs of wildfires incurred by the utilities once the Fund is in place will depend on the circumstances surrounding their preparations and responses, as well as the capacity of the Fund relative to the size of the wildfire. Below, we present several layers of costs that they could face under different conditions. After that discussion, we present a synthesis that combines the various types of exposure into a single ROE shortfall consequence.

A. Mitigation, Participation and Self-Insurance Costs

Importantly, a condition of participating in the insurance-type Wildfire Fund is that the contributions from investor owned utilities (“IOUs”) are not recoverable in rates. This is unlike the situation that would apply if the utilities bought commercial insurance to deal with these same risks, or if they simply held the corresponding amounts in disaster-fund reserves. Hence, material losses in shareholder value occur by virtue of the utilities choosing to participate in the Fund. Per the Fund contribution protocols referenced above, PG&E’s average investment in the Fund would be \$5.20 billion over the first three years of the Fund’s life and more than \$6.0 billion over ten years.

Additionally, the utilities all have existing wildfire insurance for at least the first several hundred million dollars of losses. In the case of PG&E, this coverage involves a few policies that were collectively modelled to cover about \$1.2 billion in the October Report. These insurance policies tend to have a high cost per dollar of max coverage, often in the 30-50% range. Those insurance prices, along with rates on other types of insurance (CAT bonds) are used to inform the costs of layers that the Fund may not cover for the utilities going forward. Here we assume that the utilities will continue to carry such insurance and that it will be applied before the Fund. We also assume that the costs of those policies are recoverable in rates.

B. No Access to Insurance Benefit of Fund

It is hoped and expected that it will be very rare for a utility to be found to have consciously or willfully disregarded the rights or safety of others. However, if that happens, the full disallowed portion of the claims for wildfire damages would be retained by the utilities. This is mathematically equivalent to the full exposure conditions assumed in our October Report, assuming the utility is held responsible for the full amount of the claim, though there the presumption was not willful misconduct but the simple lack of any agreed regulatory mechanism for wildfire cost funding.

Here we present the calculations for the potential loss expressed as an ROE surcharge, just to show the connection between the analytics of our prior analysis and the results in this updated report. As noted in Section III above, our original report found a PG&E exposure to about \$1 billion of after-tax wildfire insurance costs, equivalent to about 500 basis points of ROE.⁴ This calculation assumes that all of the wildfire property damage costs would be settled at their claimed value, that is, it was assumed that, on a net basis, total claims (property and non-property combined) equaled the gross property damage estimate.

⁴ Over a three-year period, it might be expected for the equity rate base to grow somewhat. Accordingly, assuming that the insurance costs remained the same in each year, we find the average annual exposure to complete lack of Fund access to have a somewhat lower cost.

The methods below apply the exact same mathematical and insurance pricing logic from the October report to the same distribution of annual expected property and acreage damages from wildfires, but with narrower focus on the tranches of risk left open by the terms of AB 1054.

C. Fund Coverage Gaps

1. Potential Reimbursement Obligation

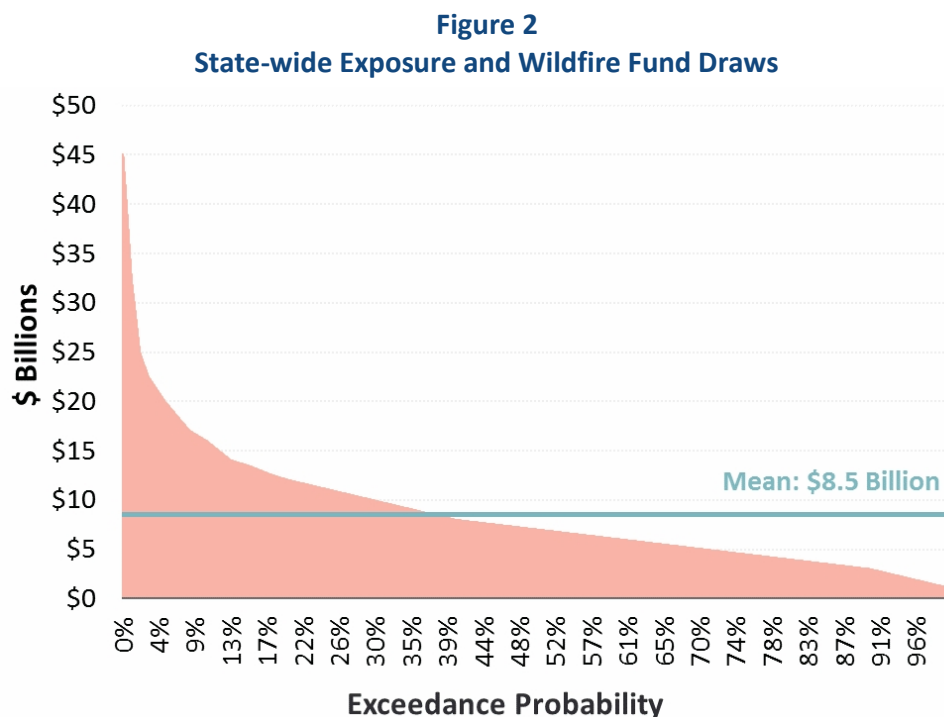
The Fund pays all eligible costs initially, providing an important liquidity function. However, as noted above, there is an effective deductible created by the capped amounts of possible costs that could be assigned to shareholders rather than recoverable from the Fund. This takes the form of disallowances of some of the damages, for which the utility must reimburse the Fund within six months of the determination that those claims are disallowed for recovery with aggregate payments over the trailing three calendar year period capped at 20% of the equity portion of its transmission and distribution (T&D) rate base. If on review by the CPUC it is deemed that uncontrollable factors, extenuating circumstances, or reasonable ambiguity about the cause of the ignition suggest only partial cost responsibility, the utility share disallowed costs may be less than the entirety of the wildfire claims. For illustration, if 20% of the equity underlying its T&D rate base is currently deemed to be \$2.7 billion, it would grow to over \$3 billion over the next three years assuming a 5% growth rate. This constitutes a layer of insurance a utility would provide, after its actual commercial insurance was used, in those conditions where its conduct related to the ignition was found unreasonable.

2. Potential Shortfall Risk

Notwithstanding its substantial size, there is significant risk that the Fund could be inadequate to cover risks over all three IOU service territories. Though unlikely, this risk is acknowledged by Moody's in the review of Fund viability as a possibility even in the early years.⁵ We arrive at this conclusion by comparing the full capacity of the Fund—at most \$21 billion of claims-paying capacity plus any income earned on investment—with available indicators of state-wide wildfire risk. From the perspective of recent history and statistical expectation, it is not hard to posit a scenario in which damage claims would outstrip fund balances. At that point, there is no specification in AB 1054 of any successorship plans for the Fund, meaning that liabilities could fall back on utilities. At a minimum, the deductible-like caps on costs assigned to shareholders would no longer be in place, though we assume the reasonableness standards survive Fund exhaustion.

⁵ Moody's Investors Service, "Rating Action: Moody's affirms Edison and Southern California Edison ratings; outlook remains negative," July 12, 2019, accessed July 2019, https://www.moody's.com/research/Moodys-affirms-Edison-and-Southern-California-Edison-ratings-outlook-remains--PR_404796.

Fundamental analysis of ROE pricing of wildfire risk in our October Report was confined to PG&E. Under AB 1054, PG&E will be a user of an IOU-wide fund, so it is necessary to understand how the aggregate draws on the Fund could affect each utility’s ability to utilize it against its own largest wildfire exposures. For this purpose, we need an aggregate wildfire cost exposure distribution. We understand that such an analysis did inform the legislation’s sizing of the Fund, but the numerical data underlying those evaluations are not public. However, Moody’s has cited to an IOU-wide Wildfire Fund durability analysis performed by a consultant to the California governor’s office (of which there is a public record based on a California State Senate committee hearing).⁶ We have relied upon the Moody’s report and the California State Senate Media Archive to compile an approximate distribution of total state wildfire exposure and related assumptions. We refer to these assumptions as the “Fund Durability Assumptions.” Based on the source cited above, we believe the statistical distribution of wildfire risk embedded in the Fund Durability Assumptions can be depicted per Figure 2.



The Fund Durability Assumptions imply that wildfires larger than the fund could occur within a single year – approximately a \$45 billion worst case. The Moody’s report also cites expectations / hopes that claim settlements will occur at “Settlement Percentage” levels as low as 45% of face value, but this would still exceed the maximum Fund balance in a worst case.

⁶ “Select Committee on Governor’s 2019 Report: Wildfires are Climate Change – California’s Energy Future,” California State Senate Media Archive, presented May 8, 2019, accessed July 2019, <https://www.senate.ca.gov/media-archive/default?title=&startdate=05%2F08%2F2019&enddate=05%2F08%2F2019&=Search>.

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From a statistical perspective, the Fund Durability Assumptions expects that the Fund has a 99.1% chance of lasting 10 years.⁷ We interpret this range of probabilities to be based on the assumption of a Settlement Percentage of approximately 45%.⁸ We understand this result to additionally depend on the deemed reasonableness of utility conduct. For example, per the fund draw and reimbursement provisions discussed above, the Fund would ultimately not be drawn on at all if all utilities were found to have acted with Willful Disregard.⁹ Conversely, if all utilities were presumed to have acted in a fully reasonable and unchallenged manner, the Fund would be drawn down faster.

For purposes of evaluating utility exposure to Fund depletion, we are less concerned with survival probabilities to different points in time than with the average likely draws. This is because for the Fund merely to survive at a non-zero level until 2030 would be insufficient to protect against all wildfire exposure (unless Settlement Percentages on all claims are at a substantial discount to their face amounts, i.e. as low as 45%). The Fund Durability Assumptions identified a pre-insurance, average annual gross claim cost of \$8.5 billion, which would be reduced by the utilities' commercial insurance and then by settlement discounts.¹⁰

Utilizing this average loss figure (with no escalation or change in likelihood) Figure 3 below presents our calculation of statistically expected wildfire exposure and coverage over a ten-year period assuming the Fund Durability Assumptions continued to apply for ten years, at Settlement percentages of 75% and 100%.

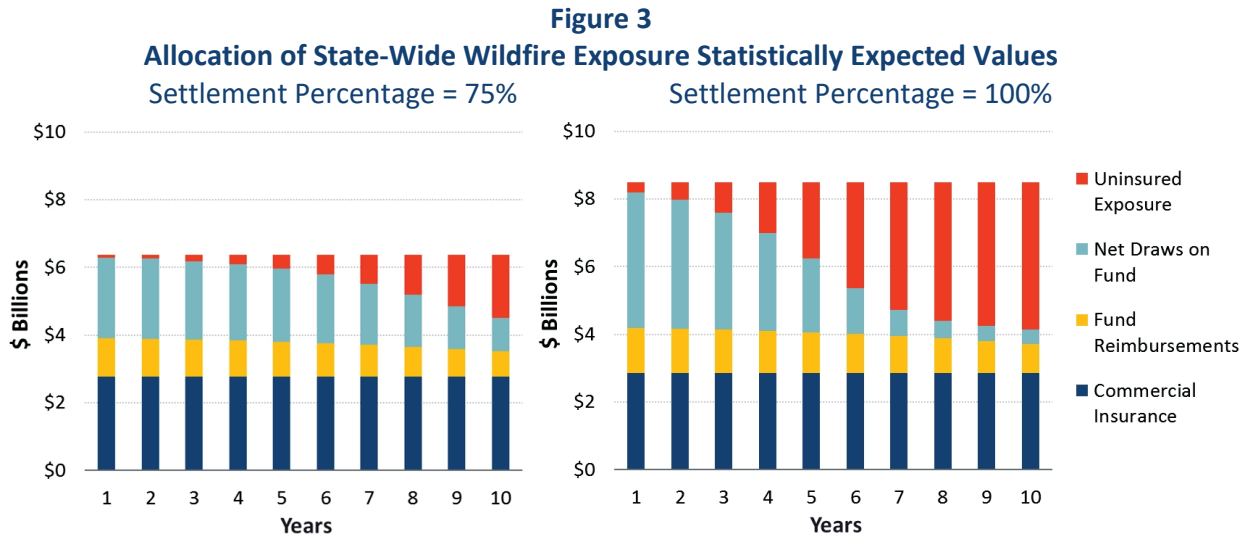
⁷ Moody's Investors Service, "Rating Action: Moody's affirms Edison and Southern California Edison ratings; outlook remains negative," July 12, 2019, accessed July 2019, https://www.moodys.com/research/Moodys-affirms-Edison-and-Southern-California-Edison-ratings-outlook-remains--PR_404796.

⁸ Moody's Investors Service, "Regulated electric utilities US: Proposed California wildfire risk legislation is credit positive but questions remain," Sector Comment, July 10, 2019, accessed July 2019, http://www.alacrastore.com/moodys-credit-research/Regulated-electric-utilities-US-Proposed-California-wildfire-risk-legislation-is-credit-positive-but-questions-remain-PBC_1183208.

⁹ That is, a full reimbursement would have to follow any such draw.

¹⁰ Moody's Investors Service, "Regulated electric utilities US: Proposed California wildfire risk legislation is credit positive but questions remain," Sector Comment, July 10, 2019, accessed July 2019, http://www.alacrastore.com/moodys-credit-research/Regulated-electric-utilities-US-Proposed-California-wildfire-risk-legislation-is-credit-positive-but-questions-remain-PBC_1183208.

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At a Settlement Percentage of 75%, the statistically expected annual exposure to wildfires would be approximately \$6.4 billion in total across all three utilities. On a first-loss basis (graphically working from bottom to top of Error! Reference source not found.), much of this might be covered by commercial insurance, here assumed to be \$3 billion IOU-wide. The next layer of exposure would be covered by utility reimbursement obligations to the Fund (the “deductible” mentioned above).¹¹ Under these assumptions, there would be, statistically speaking, a small increment of uninsured exposure even in year 1 (the top of each stacked bar in the above figure (the orange portion). That exposure would grow over time as the Fund was drawn down.

The uninsured shortfall would be amplified and accelerated at a Settlement Percentage of 100%, reaching several billion dollars per year by year ten, with statistically expected annual exposure to wildfires at more than \$8.5 billion and the Fund by then likely to be nearly depleted. Below, we apply these results about predicted attrition of the Fund to determine how much PG&E’s wildfire risks might fall against these shortfall conditions.

The statistically expected shortfall exposure shown above could create a future need for additional funding or a return to a situation of uninsured liabilities falling on utility customers and shareholders. We do not formally quantify the cost implications of that situation, but it is likely that today’s investors will regard that situation as a potential future risk for shareholder losses, regardless of their abilities to act reasonably.

We assume however that after the Fund runs out of money, the standards for just and reasonable conduct will be sustained. Thus, if a utility-related wildfire then occurs for which utilities have been deemed reasonable, we assume ratepayers will absorb the unfunded costs (which the utility

¹¹ For this analysis, we have assumed that those reimbursements would occur (up to the cap) 75% of the time in year 1 (2020), 5% less often in each subsequent year, declining to 25% of the time by 2030. This is not a forecast of the extent to which utilities will be found reasonable vs. not, but a schedule cited by Moody’s that it deemed plausible for purposes of evaluating how much financial protection the Fund and its protocols create for utility lenders and investors.

could finance with securitized debt). If the utilities are deemed responsible for such wildfires, then there is no cap on their liability for those costs and we assume all damage costs will fall back on utility shareholders as uninsured amounts at their full value. It is of course possible that the Fund would be reconstituted in the future with another mandated contribution from the utilities.

VI. Quantifying PG&E's Coverage Gaps

In the following section we address the coverage gaps identified above—Fund reimbursement and shortfall—in the specific context of PG&E and incremental ROEs needed to compensate for them over the first three years of the Wildfire Fund's life. We start with a discussion of key assumptions. Then, for reference, we provide a matrix of outcomes representing the full range of assumptions made. We conclude by considering the matrix values in context and positing reasonable ranges of ROEs.

A. Key Assumptions

1. Settlement Percentages

The calculations in our October 2018 Report assumed utilities would settle claims at 100% of face value (i.e., at the full value of costs underlying their risk distributions for potential wildfire damages). We believe this remains a possibility (for reasons discussed later) but the new law and the Fund Durability Assumptions imply that actual draws may only be at some fraction of original claims.¹² If so, the risk distributions of cost exposure are smaller. Accordingly, we have calculated costs across a range of assumed Settlement Percentages.

2. Disallowance Percentages

The other key assumption is the degree to which utility conduct is likely to be deemed reasonable, whether for purposes of access to the Fund or to recover Fund shortfalls. Beginning with the worst possible case, PG&E could in principle still face the same size liabilities as we initially estimated in the October 2018 Report—roughly 500 basis points against its rate base equity—if a combination of no claims' subrogation, bad luck or imperfect fire mitigation or response execution, and antagonistic public response and regulatory reaction finding willful misconduct, should cause all damage costs to be disallowed. It is hoped that this outcome will be extremely unlikely, but because of the complex and contentious nature of wildfire evaluations, it cannot be discounted to zero. (While it could be argued that in the situation of significantly irresponsible utility wildfire management, it should not be eligible for either the Fund or any equity risk compensation

¹² Moody's Investors Service, "Regulated electric utilities US: Proposed California wildfire risk legislation is credit positive but questions remain," Sector Comment, July 10, 2019, accessed July 2019, http://www.alacrastore.com/moodys-credit-research/Regulated-electric-utilities-US-Proposed-California-wildfire-risk-legislation-is-credit-positive-but-questions-remain-PBC_1183208.

consideration, it is noteworthy that such losses would block the utility from access to its own monies that it contributed to the Fund. Had it not participated in the Fund and the same circumstances arose, it would have faced the same liability but had its original monies.)

At the other extreme, for wildfires where the utility is deemed 100% in compliance with mitigation and response expectations, it will be held harmless and have no unrecovered costs (unless and until the Fund runs out of money). No supplemental wildfire risk premium would be required. It is hoped this will be the vast majority of situations, but again the complexity of such disastrous conditions makes it implausible that there will always be agreement that reasonable conduct occurred. (This situation, desirable as it is for the utility shareholders, accelerates the depletion of the Fund because there would be no portion of the wildfire costs that would be borne by shareholders. That creates a new kind of shareholder risk for Fund depletion, described later.)

The intermediate condition of some degree or proportion of wildfires being challenged for conduct and found unreasonable is the one requiring most analysis which presumably represents the vast majority of circumstances likely to arise. Here we analyze two types of cases – first, a case where the utility is found unreasonable in 50% of wildfire incidents, and second an adaptation of the reported assumption that utilities will be found unreasonable on a sliding scale, starting at 75% of wildfire incidents in 2020, declining to 25% in 2030.¹³

B. Scenario Costs and Range

1. Potential Reimbursement Obligation

A range of PG&E exposures to Fund reimbursement obligations is shown in Figure 4 below.

Figure 4 shows exposures assuming Settlement Percentages of 70% and 100%. Note that in each case, maximum net exposure (line 1) exceeds the Fund reimbursement cap of \$2.98 billion (line 3), which therefore remains the same across all cases. What does change with Settlement Percentages is the 3-year expected loss percentage (line 4).¹⁴ This is because the likelihood of reaching the cap is increased with higher overall damage claims. Insurance costs are then calculated based on the same methodology used in our October 2018 Report (line 7), and implied ROEs are derived as the quotient of insurance costs and average equity rate base (line 11).

Figure 4 also shows the impact of varying assumptions for Disallowance Percentages, comparing the 50% case to the sliding scale case described above (denoted as 70%, representing the average of 75%, 70%, and 65% over the three-year period). To reflect these assumptions, the 50% and 70% Disallowance Percentages are simply applied to the ROEs reflecting the entirety of the

¹³ This is equivalent to saying that half the time, the utility would be deemed entirely reasonable and half the time entirely unreasonable.

¹⁴ The expected loss is calculated with reference to a 3-year distribution of wildfire costs in recognition of the fact that the reimbursement cap applies on a 3-year basis.

Continued on next page

reimbursement cap.¹⁵ Intuitively, the higher the assumed Disallowance Percentage, the higher the corresponding ROE. The range of ROEs across these cases is 0.25% to 0.72%.

Figure 4
Wildfire Fund Reimbursement Exposure

| Settlement % Average Disallowance % | | | 70% | | 100% | |
|--|----------------------|------|-------|-------|-------|-------|
| | | | 50% | 70% | 50% | 70% |
| Maximum Net Exposure (per Whitepaper) | <i>(\$ Billions)</i> | [1] | 15.60 | 15.60 | 22.80 | 22.80 |
| Fund Reimbursement Exposure: | | | | | | |
| Average Cap Level | <i>(\$ Billions)</i> | [3] | 2.98 | 2.98 | 2.98 | 2.98 |
| 3 Year Expected Loss | <i>(%)</i> | [4] | 1.75% | 1.75% | 3.05% | 3.05% |
| Insurance Cents on the Dollar | <i>(¢/\$)</i> | [5] | 9.98 | 9.98 | 14.29 | 14.29 |
| Insurance Cost | <i>(\$ Billions)</i> | [6] | 0.30 | 0.30 | 0.43 | 0.43 |
| Annualized Insurance Cost | <i>(\$ Billions)</i> | [7] | 0.10 | 0.10 | 0.14 | 0.14 |
| Annualized Insurance Cost Less Tax Shield | <i>(\$ Billions)</i> | [8] | n/a | n/a | n/a | n/a |
| Average Equity Rate Base | <i>(\$ Billions)</i> | [9] | 19.78 | 19.78 | 19.78 | 19.78 |
| Implied ROE | <i>(% ROE)</i> | [10] | 0.50% | 0.50% | 0.72% | 0.72% |
| Implied ROE after Disallowance % | <i>(% ROE)</i> | [11] | 0.25% | 0.35% | 0.36% | 0.50% |

2. Potential Shortfalls

A range of PG&E exposures to potential Fund shortfalls is shown in Figure 5 below.

As with the Fund reimbursement cases, Figure 5 shows exposures assuming Settlement Percentages of 70% and 100%. However, unlike the Fund reimbursement cases, potential shortfalls are highly sensitive to assumptions about Settlement Percentages.

For the 100% Settlement Percentage case, insurance costs are calculated based on the same methodology used in our October 2018 Report (line 4), and implied ROEs are derived as the quotient of insurance costs and average equity rate base (line 7).

Figure 5 also shows the impact of varying assumptions for Disallowance Percentages, comparing the 50% case to the sliding scale case described above (again denoted as 70%). To reflect these assumptions, the 50% and 70% in this case change the shortfall amounts, even assuming a constant 100% Settlement Percentage. This is because, at a higher Disallowance Percentage, assumed applicable to all utilities in this case, not just PG&E, the Fund will be drawn down more slowly and any shortfall relative to a draw by PG&E will be reduced.

The range of ROEs across these cases is 0.04% to 1.8%.

¹⁵ Again, equivalent to saying that part of the time, the utility would be deemed entirely reasonable and the remainder entirely unreasonable.

Figure 5
Wildfire Fund Shortfall Exposure

| Settlement % Average Disallowance % | | | 70% | | 100% | |
|--|----------------------|-----|-------|-------|-------|-------|
| | | | 50% | 70% | 50% | 70% |
| Maximum Net Exposure (per Whitepaper) | <i>(\$ Billions)</i> | [1] | 15.60 | 15.60 | 22.80 | 22.80 |
| Fund Shortfall Exposure: | | | | | | |
| Average Max Exposure Less Fund Beginning | <i>(\$ Billions)</i> | [2] | 0.46 | 0.27 | 8.54 | 8.16 |
| Insurance Cents on the Dollar | <i>(¢/\$)</i> | [3] | 4.21 | 4.21 | 4.24 | 4.23 |
| Insurance Cost | <i>(\$ Billions)</i> | [4] | 0.02 | 0.01 | 0.36 | 0.35 |
| Average Equity Rate Base | <i>(\$ Billions)</i> | [5] | 19.78 | 19.78 | 19.78 | 19.78 |
| Implied ROE | <i>(% ROE)</i> | [6] | 0.09% | 0.06% | 1.81% | 1.72% |
| Implied ROE after Disallowance % | <i>(% ROE)</i> | [7] | 0.05% | 0.04% | 0.90% | 1.18% |

3. Overall ROE Shortfall

Since the above coverage gaps are additive, the overall range could be thought of as 30 basis points to approximately 150 basis points.

VII. Conclusion

The above indicates there are a variety of conditions that result in cost shortfalls ranging from the entirety of damaged property and other injury losses (in the event of no access to the insurance function of the Fund), to capped shares of costs when successfully challenged as not satisfying reasonable expectations, to zero shareholder responsibility (because costs assigned fully to the Fund). Then there could be additional costs if/when the Fund is drawn down to the point where it could not fully cover the full costs of wildfires. That risk will in turn depend on how successful the Fund managers and utilities are in reaching claims settlements at a discount to their face request.

Importantly, these amounts do not include any request for compensation if they should be denied access to the Fund, nor any compensation for past contributions, lost equity returns on capitalized mitigation cost expenditures, or any exposure to future Fund replenishment (or growing depletion risk) in years beyond 2022. It is very likely that equity investors will regard those as risky and perhaps unreasonable loss exposures that will affect their willingness to invest. By excluding these considerations, the above calculations are conservative.

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PACIFIC GAS AND ELECTRIC COMPANY
APPENDIX A
STATEMENT OF QUALIFICATIONS

Robert Mudge

Principal

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Mr. Robert Mudge is an expert in corporate and project finance matters in the energy industry. He has advised energy clients on issues relating to asset valuation, credit requirements and financial viability in the context of litigation, international arbitration, utility regulatory processes and disputes, and mergers and acquisitions.

Mr. Mudge has provided expert testimony in diverse forums on matters with a direct bearing on financial feasibility and/ or impact, including the Federal Energy Regulatory Commission, public utility commissions in Massachusetts, Missouri, and Alberta, as well as the Massachusetts Superior Court and the Maine Department of Environmental Protection. He has testified on other matters in Alaska, Illinois, Michigan, Kentucky, the United States Tax Court, and the International Centre for Settlement of Investment Disputes. Additionally, Mr. Mudge was a primary author of Brattle “white papers” in 2018 and 2019 on the financial impact of wildfires on California utilities.

In his previous work as an investment banker, Mr. Mudge played a central role in developing financeable contract structures for large public/private infrastructure projects, utility mergers and acquisitions, bankruptcy restructuring, and numerous power project financings. He has also served on the advisory board of a start-up venture focused on the acquisition, development, and operation of renewable fuel generation projects. Mr. Mudge served as Brattle’s COO and Treasurer from 2014 to March 2017.

AREAS OF EXPERTISE

- Electric Power
- Financial Institutions
- Regulatory Finance and Accounting
- Utility Regulatory Practice and Ratemaking
- Valuation

EDUCATION

Mr. Mudge received an M.B.A. in Finance and Economics from the University of Chicago, Graduate School of Business, Chicago, IL, and a B.A. (cum laude) from Harvard College, Cambridge Massachusetts.

ASSOCIATIONS

Energy Bar Association, Chair - Finance and Transactions Committee, 2016-2017.

EXPERIENCE

- For Nicor Gas, Mr. Mudge prepared a cost of equity analysis. (See also Testimony, below.)
- For a confidential client, Mr. Mudge submitted testimony in an international arbitration proceeding incorporating the cash flow valuation of an integrated electric utility.
- For Goldman Sachs, assessed a financial model to support a bond issue for biofuels project.
- For Duke Energy Carolinas LLC and Duke Energy Progress LLC, Mr. Mudge provided analytic support and interrogatories in connection with Duke regulatory negotiations with solar developers.
- For Sharyland Utilities L.P. rate case, Mr. Mudge provided analytic support and interrogatories in connection with intervener assertions that Sharyland's REIT structure exposed customers to incremental cost and risk.
- For Anchorage Municipal Light & Power ("ML&P"), Mr. Mudge developed a rate stabilization plan in connection with an investment that increased ML&P's net plant by more than 70%. The plan included design of a regulatory asset for recovery over a 35-year period. (See also Testimony, below.)
- For the Massachusetts Water Resources Authority ("MWRA"), Mr. Mudge assessed the historic and current cost of capital for a dedicated electricity line providing delivery service to MWRA's Deer Island water treatment facility and implications for associated service charges. (See also Testimony, below.)
- For an investor owned utility company in a regulatory proceeding, Mr. Mudge assessed the rationale for and impact of preferential "load-retention" tariff requested by major industrial customer, including an analysis of customer liquidity and financing. (See also Testimony, below.)
- For ISO-New England ("ISO-NE"), Mr. Mudge assessed the implications of ISO-NE's proposal to integrate stronger performance incentives—referred to as "Pay For Performance"—with the existing Forward Capacity Market for the feasibility of debt and equity financing of new generation entering the ISO. (See also Testimony, below.)
- For Enel Green Power S.p.A. ("Enel"), Mr. Mudge assessed the contingent value of Enel's ownership stake in LaGeo S.A. de C.V. ("LaGeo"), a geothermal development and operating company with a portfolio of assets in El Salvador. (See also Testimony, below.)
- For an investor owned utility company exploring strategic alternatives, Mr. Mudge analyzed potential responses to distributed renewable energy projects and associated adverse effects

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on load growth (including potential utility ownership of distributed generation and inclusion in rate base).

- For an independent power developer seeking to sell power to an investor owned utility, Mr. Mudge assessed the impact of the imputed debt treatment likely to be applied by rating agencies with respect to a power purchase agreement. (See also Testimony, below.)
- For an unsecured creditor in the bankruptcy of TerreStar Networks Inc., Mr. Mudge assessed potential payouts based on contingencies including the outcome of litigation concerning the validity of secured creditor liens and proposed early payouts to secured creditors.
- For the Department of the Treasury, Mr. Mudge assessed the structure and financing of a \$10 billion + cross border utility merger. The assignment included comparison of affiliate debt financing with comparable “arm’s length” financing visible in the marketplace in the relevant timeframe. (See also Testimony, below.)
- For a special litigation committee established in connection with a shareholder lawsuit brought against a developer of renewable energy projects, Mr. Mudge assessed debt and equity financing options that could have been brought to bear to optimize shareholder returns. (See also Testimony, below.)
- For an investor owned electric utility, Mr. Mudge developed financial analysis to assess potential capital initiatives to address transmission expansion and compliance with environmental regulations and renewables mandates, as well as accompanying rate structures.
- For an electric cooperative, Mr. Mudge managed financial analysis in connection with transformative restructuring of \$1.2 billion generation and transmission electric cooperative, reporting to the CEO, CFO, and transaction counsel. The restructuring included termination of complex power supply arrangements, lease unwind, acquisition of generating assets, acquisition of new customers, related financing arrangements and securing an investment grade credit rating. The restructuring also replaced a previously existing mortgage with the Rural Utilities Service with a new senior secured indenture. (See also Testimony, below.)
- In the formation of a renewable energy debt fund, Mr. Mudge advised the managers on portfolio structuring, credit analysis and related protocols, and implementation.
- In the process of a power plant sale, Mr. Mudge managed a multi-disciplinary team in providing market analysis and financial modeling in support of a successful bid for a \$300 million generating plant asset.
- For an LNG developer, Mr. Mudge provided analysis and expert testimony before the state Board of Environmental Protection on project financial capacity to support environmental permitting and compliance. (See also Testimony, below.)
- Mr. Mudge completed a financeability analysis relating to \$2.5 billion capital project proposed to operate under long term contract with the US Department of Energy (DOE).

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- Mr. Mudge provided analysis and expert testimony before arbitration panel relating to costs incurred in delayed startup of a 1,000 MW merchant power plant. (See also Testimony, below.)
- For project counsel, Mr. Mudge developed a working finance plan and analysis to optimize construction costs for a \$1.2 billion new-build power project proposed to be owned by a consortium including IOUs, municipalities, and an electric cooperative.
- Mr. Mudge evaluated diverse financing options for the Tennessee Valley Authority (TVA) relating to nuclear repowering initiatives and investment in emissions control equipment, reporting to the CFO.
- As a member of the advisory board for a start-up venture, Advanced Renewables, LLC, Mr. Mudge advised on acquisition, development, and operation of renewable-fuel generation projects, consultation on structuring, acquisition prospects, and capitalization.
- For a major contractor to US Department of Energy (DOE), Mr. Mudge provided assistance on project finance structuring and sourcing for privatized environmental projects, including creation of financeable contract structure and assembly of top-tier financing syndicate.
- For US utility and independent energy clients, Mr. Mudge identified and implemented asset and corporate acquisitions, including advice on valuation, due diligence, approach, and negotiations and assessment of key drivers.
- With a major multi-lateral agency, Mr. Mudge participated in the structuring of a debt and equity investment fund for emerging markets power projects.
- As a project finance banker, Mr. Mudge conducted numerous transactions domestically and abroad in electric power generation, oil and gas pipelines, and other infrastructure.

REPORTS AND PRESENTATIONS

- “California Megafires: Approaches for Risk Compensation and Financial Resiliency Against Extreme Events,” filed to accompany SCE’s TO2019A transmission owner tariff filing before FERC in Docket No. EL19-__-000 (with F. Graves), April 2019.
- “California Megafires: Approaches for Risk Compensation and Financial Resiliency Against Extreme Events,” filed to accompany PG&E’s “TO20” transmission cost of capital testimony before FERC in Docket No. EL19-13-000 (with F. Graves and M. Geronimo), October 2018.
- “Resetting FERC ROE Policy: A Window of Opportunity,” Published by The Brattle Group, Inc., (with A. Sheilendranath and F. Graves), May 2018.
- “New Tax Law and its Impact on Rates,” Panelist, Energy Bar Association Annual Meeting, May 2018.

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- “The Evolving Energy Landscape: Transformation of the Power Market,” Featured Speaker, POWER Engineers Symposium, April 2018.
- “How Will We Pay for AV Infrastructure and Operations?” Panelist, Pennsylvania Automated Vehicle Summit, April 2018.
- “What's Ahead for US Public Private Partnership Infrastructure Development,” Panelist, National Council for Public-Private Partnerships, April 2018.
- “History & Legal Framework of PURPA,” Panelist, Electric Utility Consultants, Inc.’s (EUCI) Public Utilities Regulatory Policies Act 101 conference, March 2018.
- “Rising Tide of Next Generation U.S. P3s – and How to Sustain It,” Study published by The Brattle Group, Inc., (with E. Buckberg and H. Sheffield), February 27, 2018.
- “New Technologies and Old Issues under PURPA,” Norton Rose Fulbright Project Finance Newswire, (with M. Celebi, M. Chupka, and P. Cahill), February 20, 2018.
- “Six Implications of the New Tax Law for Regulated Utilities,” Analysis published by The Brattle Group, Inc., (with B. Villadsen and M. Tolleth), January 2018.
- “The History of PURPA and the Evolving PURPA/QF Landscape,” Panelist, Electric Utility Consultants, Inc. (EUCI) Public Utility Regulatory Policies Act of 1978 Litigation and Qualifying Facilities Symposium, November 2017.
- “Risk and Return for Regulated Utilities”, moderated panel discussion accompanying book release during NARUC Summer Policy Summit, July 18, 2017.
- “High Market-to-Book Ratios Among Regulated Utilities—A Review of Plausible Drivers”, presentation to the Center for Research in Regulated Industries Western Conference, June 29, 2017.
- “Ongoing Climate Imperative,” moderated Energy Bar Association panel discussion. November 10, 2016.
- “Energy System Optimization: The Role of Decentralization,” Panelist, Vermont Law School Alumni in Energy’s Third Annual Energy Symposium. October 6, 2016.
- “Powering America: An Analysis of Policy and Market Developments Impacting the US Power Sector”, moderated panel at American Bar Association Business Law Section Annual Meeting (with M. Celebi, Susan Nickey of Hannon Armstrong, and Elias Hinckley of Sullivan & Worcester). September 10, 2016.
- “Scaling the Economics of Solar PV,” presentation to the Wisconsin Public Utility Institute. February 25, 2016.
- “Key Developments and Trends in the US Power Industry,” webinar for Thompson Reuters Practical Law (with M. Chupka, Susan Nickey of Hannon Armstrong, and Elias Hinckley of Sullivan & Worcester). February 23, 2016.
- “Comparative Generation Costs of Utility-Scale and Residential-Scale PV in Xcel Energy

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Colorado's Service Area," report prepared for First Solar, with support from Xcel Energy and EEI (with P. Fox-Penner, B. Tsuchida, S. Sergici, W. Gorman, and J. Schoene). July 2015.

- Distributed solar payback analysis in support of Reply Comments by Southern California Edison Company in connection with California Public Service Commission Rulemaking 12-11-005: Order Instituting Rulemaking Regarding Policies, Procedures and Rules for California Solar Initiative, the Self-Generation Incentive Program and Other Distributed Generation Issues (with M. Vilbert and J. Wharton). December 23, 2013.
- "Overview of Rooftop Solar PV 'Green Bank' Financing Model," sponsored by Connecticut Clean Energy Finance and Investment Authority and the Coalition for Green Capital. January 17, 2013.
- "Can PURPA Legacy Help Utilities Manage DG Concerns?" presented at the Energy Bar Association 2013 mid-year meeting and conference. October 24, 2013.
- "ERCOT Investment Incentives and Resource Adequacy," report prepared for the Electric Reliability Council of Texas (with S. Newell, K. Spees, J. Pfeifenberger, M. DeLucia, and R. Carlton). June 1, 2012.
- "MLPs for Renewables: Complement or Substitute for Tax Credits?", presented at the EUCI Conference on Renewable Energy M&A Transactions, San Diego, CA, December 6, 2011.
- "Optimizing Gas for Flexible Power," presented at the Utility Scale Flexible Power Summit, Denver, CO, September 28, 2011.

TESTIMONY

International Centre for Settlement of Investment Disputes. Confidential expert report assessing the value of an electric utility, March 29, 2019 and in front of the Tribunal, June 20, 2019.

Illinois Commerce Commission, Northern Illinois Gas Company d/b/a Nicor Gas Company proposed general increase in gas rates. Direct testimony on behalf of Nicor Gas, supporting an increase in gas rates. November 9, 2018.

International Centre for Settlement of Investment Disputes. Confidential expert report assessing the value of an electric utility. June 29, 2018.

Regulatory Commission of Alaska, In the Matter of the Tariff Revisions, Designated as TA357-121, filed by the Municipality of Anchorage d/b/a Municipal Light and Power Department. Direct testimony on behalf of Anchorage Municipal Light & Power ("ML&P"), supporting a rate stabilization plan to reallocate the recovery of investment that increased net plant by more than 70%. The plan included design of a regulatory asset for recovery over a 35-year period. December 30, 2016.

Commonwealth of Massachusetts Department of Public Utilities, Case D.P.U. 15-157. Direct testimony on behalf of the Massachusetts Water Resources Authority (“MWRA”) in response to the Petition and associated filings of NSTAR in Massachusetts Department of Public Utilities (“D.P.U.”) 15-157 with respect to appropriate project financing for dedicated electricity delivery facilities for MWRA’s Deer Island water treatment facility and NSTAR’s proposed tariff. February 9, 2016.

Missouri Public Service Commission, Case No. ER-2014-0258. Rebuttal testimony on behalf of Ameren Missouri in the matter of Noranda Aluminum, Inc.’s request for revisions to Ameren Missouri’s Large Transmission Service Tariff to decrease its rate for electric service (as part of a general Ameren rate case). Analysis addressing Noranda’s claim of imminent liquidity crisis, potential alternative capital sourcing, and Noranda’s competitive position in U.S. aluminum industry. January 15, 2015.

International Centre for Settlement of Investment Disputes, Case No. ARB/13/18 (Enel Green Power S.p.A. (“Enel”) v. Republic of El Salvador). Expert report assessing the contingent value of Enel’s ownership stake in LaGeo S.A. de C.V. (“LaGeo”), a geothermal development and operating company with a portfolio of assets in El Salvador, associated with Enel’s rights under a shareholder agreement with the government of El Salvador. December 5, 2014.

Missouri Public Service Commission, Case No. EC-2014-0224. Rebuttal testimony on behalf of Ameren Missouri in the matter of Noranda Aluminum, Inc.’s request for revisions to Ameren Missouri’s Large Transmission Service Tariff to decrease its rate for electric service. Analysis addressing Noranda’s claim of imminent liquidity crisis, potential alternative capital sourcing, and Noranda’s competitive position in U.S. aluminum industry. May 9, 2014.

Federal Energy Regulatory Commission, Docket Nos. ER14-1050. Testimony responding to protests, comments and testimony submitted in ER14-1050 by the New England Power Pool Participants Committee (“NEPOOL”) and others suggesting that ISO New England’s proposal to integrate stronger performance incentives—referred to as “Pay For Performance”—with the existing Forward Capacity Market would materially hinder debt and equity financing of new generation entering the ISO-NE market. March 3, 2014.

Michigan Public Service Commission, Case No. U-17429. Direct testimony in the matter of the application of Consumers Energy Company for approval of a Certificate of Necessity for the Thetford Generating Plant and for related accounting and ratemaking authorizations. Assessment of imputed debt impact and accompanying financial risks asserted by Consumers in connection with power purchase agreements. October 29, 2013.

Alberta Utilities Commission, Application No. 1607670, Proceeding ID 1449, Alberta Electric System Operator Competitive Process Application. Written testimony assessing AESO proposed evaluation methodology for the financing component of proponents’ RFP bids in connection with the Competitive Process for Critical Transmission Infrastructure (CTI). June 1, 2012.

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“N.A. General Partnership v. Commissioner,” Expert Report in connection with testimony before the United States Tax Court in the matter of NA General Partnership & Subsidiaries, Iberdrola Renewables Holdings, Inc. & Subsidiaries, Successor in Interest to NA General Partnership & Subsidiaries, Docket 525-10. April 8, 2011.

“Assessment of Powerbank Transactions – Commercial Rationale and Consistency with Allocation of 2007 Sale Proceeds,” Expert Report in the matter of Paul Bergeron, on behalf of Ridgewood Electric Power Trust V and Ridgewood Power Growth Trust v. Ridgewood Renewable Power, LLC, C.A. No. 07-1205 BLS1. October 28, 2010.

Kentucky Public Service Commission, Case No. 2007-00455 on behalf of Big Rivers Electric Corporation, regarding the Applications of Big Rivers Electric Corporation for: (I) Approval of Wholesale Tariff Additions for Big Rivers Electric Corporation, (II) Approval of Transactions, (III) Approval to Issue Evidences of Indebtedness, and (IV) Approval of Amendments to Contracts; and of E.ON U.S., LLC, Western Kentucky Energy Corp., and LG&E Energy Marketing, Inc., for Approval of Transactions. 2007.

Testimony before the Maine Board of Environmental Protection in the matter of Downeast LNG, Inc. and Downeast Pipeline LLC LNG Terminal and Pipeline, Robbinston, Calais, Baring PLT, Baileyville, and Princeton L-23432-26-A-N, L-23432-TG-B-N, and A-000960-71-A-N. June 2007.

Testimony before American Arbitration Association Construction Industry Tribunal in the matter of the arbitration between The Shaw Group/Stone & Webster, Inc. vs. New Harquahala Generating Company, LLC Case No. 16 110Y00 242 04. 2005 and 2006.